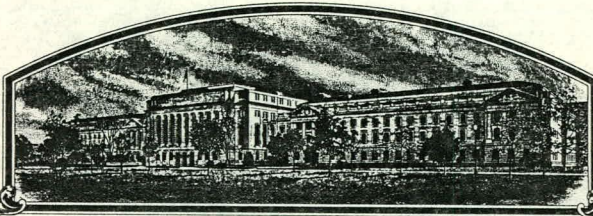


No.

8600012



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Pioneer Hi-Bred International, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE
Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF *eighteen* YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT (AT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

SORGHUM

'PH227'



In Testimony Whereof, I have hereunto set
my hand and caused the seal of the Plant
Variety Protection Office to be affixed
at the City of Washington, D. C.
this *29th* day of April in
the year of our Lord one thousand nine
hundred and eighty-eight.

Attest:

Kenneth H. Evans
Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Richard E. Lyng
Secretary of Agriculture

Replaced Original
2/17/88, AB

SORGHUM
'PH227'

14A. Exhibit A. Addendum Origin and Breeding History

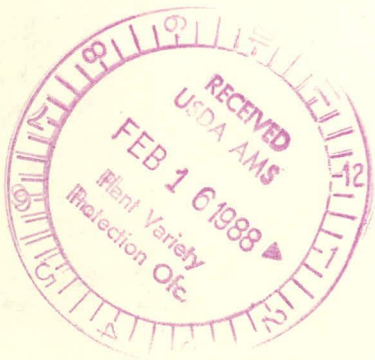
PEDIGREE: 093/ET95<3041-CW)XB421X

Pioneer line 'PH227', sorghum bicolor M., a grain sorghum inbred, was developed by Pioneer Hi-Bred International, Inc., from the single cross PH093 X ET95<3041)XB421X using the pedigree method of breeding. PH093 is a proprietary downy mildew resistant line of Pioneer Hi-Bred International, Inc., and ET95<3041 is a third backcross F6 recovery where ET95 (IS12608) is a tropical line and PH041 is a Pioneer Hi-Bred International, Inc. inbred used as the non-recurrent parent during the backcross program to convert the tropical line to a temperate response. The final selection (XB421X) is a white seeded stable F5 inbred that restores A1 cytoplasm and was identified to be resistant to downy mildew. Selfing and visual selection was practiced within the above cross for five generations in the development of 'PH227'. The inbred was developed at Taft, Texas. During line development, the F4 generation was crossed to an inbred tester for the purpose of estimating the line's combining ability. Topcross yield tests were grown in South Texas in 1976. Additional hybrid combinations were observed and evaluated at the South Texas station and at other Pioneer research stations in 1977-1985. The line was evaluated, confirmed to be true breeding and bulked to type and uniformity in 1977. The first bulk increase was made in 1979.

'PH227' has shown uniformity and stability for all traits as described in Exhibit C. It has been self pollinated, bulk increased and checked for uniformity of plant type to assure genetic homozygosity and phenotypic stability. The line has been increased by hand pollination and in isolated fields with continued observation for uniformity.

This inbred will have a tall variant that occurs, due to mutation, at a frequency of 30 in 10,000, on the average. This is due to a gene that is unstable for height at the DW3 locus.

Pioneer Hi-Bred International, Inc., Des Moines, Iowa, is the employer of the plant breeders involved in the selection and development of 'PH227'. Pioneer Hi-Bred International, Inc., has the sole rights and ownership of 'PH227'.



S O R G H U M

'PH227'

14B. Exhibit B. Novelty Statement

Although 'PH227' is not closely similar to any public inbred line, it most nearly resembles TX430, a public inbred line released from Texas A & M University. Compared to TX430, 'PH227' is 17% shorter and 28% more open headed, has harder seed, equal stalk breakage scores, better roots, much higher anthracnose scores, better scores for downy mildew (Pathotype 1 and 3), equal scores for Helminthosporium turcicum, equal scores for MDMV, lower scores for leaf rust, lower scores for head smut, and equal scores for grey leaf spot. 'PH227' has awns and TX430 is awnless.

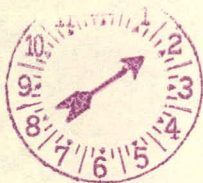
Downy mildew
Anthracnose
Grey leaf spot
Head smut
Leaf rust

Peronosclerospora sorghi
Colletotrichum graminicola
Cercospora sorghi
Sphacelotheca reiliana
Puccinia purpurea

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APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions on reverse)

No certificate for plant variety protection may be issued unless a completed application form has been received (5 U.S.C. 553).

1. NAME OF APPLICANT(S) Pioneer Hi-Bred International, Inc.		2. TEMPORARY DESIGNATION	3. VARIETY NAME PH227
4. ADDRESS (Street and No. or R.F.D. No., City, State, and Zip Code) Plant Breeding Division Department of Sorghum Breeding P.O. Box 1506, Plainview, TX 79072		5. PHONE (Include area code) 306/293-4377	FOR OFFICIAL USE ONLY VPVO NUMBER 8600012
6. GENUS AND SPECIES NAME Sorghum bicolor	7. FAMILY NAME (Botanical) Gramineae		FILING DATE 10/25/85 TIME 2:00 <input type="checkbox"/> A.M. <input checked="" type="checkbox"/> P.M.
8. KIND NAME Sorghum	9. DATE OF DETERMINATION 1979		AMOUNT FOR FILING \$ 1,800 DATE 10/25/85
10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION (Corporation, partnership, association, etc.) Corporation			AMOUNT FOR CERTIFICATE \$ 200 DATE 3/11/88
11. IF INCORPORATED, GIVE STATE OF INCORPORATION Iowa			12. DATE OF INCORPORATION

13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS

Dr. L. Gene Dalton
Plant Breeding Division
Pioneer Hi-Bred International, Inc.
P.O. Box 1506
Plainview, TX 79072

806/293-4377

14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED

- a. ☒ Exhibit A, Origin and Breeding History of the Variety (See Section 52 of the Plant Variety Protection Act.)
- b. ☒ Exhibit B, Novelty Statement
- c. ☒ Exhibit C, Objective Description of the Variety (Request form from Plant Variety Protection Office.)
- d. ☒ Exhibit D, Additional Description of the Variety

15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? (See Section 83(a) of the Plant Variety Protection Act.)

☐ Yes (If "Yes," answer items 16 and 17 below) ☒ No

16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?

☐ Yes ☐ No

17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED?

☐ Foundation ☐ Registered ☐ Certified

18. DID THE APPLICANT(S) FILE FOR PROTECTION OF THE VARIETY IN THE U.S. OR OTHER COUNTRIES?

☐ Yes (If "Yes," give names of countries and dates)

☒ No

19. HAVE RIGHTS BEEN GRANTED IN THE U.S. OR OTHER COUNTRIES?

☐ Yes (If "Yes," give names of countries and dates)

☒ No

20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable.

The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in Section 41, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF APPLICANT

Pioneer Hi-Bred International, Inc.
BY:

DATE

SIGNATURE OF APPLICANT

DATE

Lennie H. Dalton

September 18, 1985

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U.S. Department of Agriculture
Agricultural Marketing Service
Livestock, Poultry, Grain & Seed Division
Beltsville, Maryland 20705

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14C. Exhibit C.

Objective Description of Variety

SORGHUM SPP.

1. KIND:

☐ 1 = Sorghum bicolor 2 = Sorghum almum 3 = Sorghum X Sudangrass
4 = Sorgrass 5 = Sorghum sudanense 6 = Sorghum halepense

2. MATURITY:

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Days from planting to mid-bloom			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No. days earlier than	<input type="checkbox"/>	1=Wheatland 2=OK8 3=Martin	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	No. days later than	<input type="checkbox"/>	4=Redlan 5=Blackhull	

3. PLANT:

☐ Coleoptile: 1=Green 2=Red
Plant Pigment: ☐ 1=Tan 2=Red 3=Purple
☐ 1=Sunred present 2=Sunred absent

4. STALK:

<input type="checkbox"/>	<input type="checkbox"/>	mm Diameter at 3 rd internode above ground
<input type="checkbox"/>	<input type="checkbox"/>	cm Length from soil level to top of panicle
<input type="checkbox"/>	<input type="checkbox"/>	1=With bloom 2=Bloomless
<input type="checkbox"/>	<input type="checkbox"/>	1=Uniculm 2=Tillering
<input type="checkbox"/>	<input type="checkbox"/>	1=Sweet 2=Insipid
<input type="checkbox"/>	<input type="checkbox"/>	1=Pithy 2=Juicy

5. LEAF (Below flag leaf):

<input type="checkbox"/>	<input type="checkbox"/>	cm Width	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	cm Length
<input type="checkbox"/>	<input type="checkbox"/>	No. per main stalk				
<input type="checkbox"/>	<input type="checkbox"/>	Color: 1=Light green 2=Golden 3=Dark green				
<input type="checkbox"/>	<input type="checkbox"/>	Color Pattern: 1=Solid 2=Spotted 3=Streaked 4=Zonated 5=Striped				
<input type="checkbox"/>	<input type="checkbox"/>	Texture: 1=Smooth 2=Wavy 3=Wrinkled				
<input type="checkbox"/>	<input type="checkbox"/>	Attitude: 1=Erect 2=Horizontal 3=Drooping				
<input type="checkbox"/>	<input type="checkbox"/>	Ligule: 1=Present 2=Absent				
<input type="checkbox"/>	<input type="checkbox"/>	Midrib Color: 1=White 2=Cloudy 3=Yellow				

6. INFLORESCENCE:

<input type="checkbox"/>	Stigma: 1=White 2=Yellow
<input type="checkbox"/>	Anther: 1=White 2=Yellow
<input type="checkbox"/>	Heads: 1=Compact 2=Semi-compact 3=Semi-open 4=Open
<input type="checkbox"/>	Shape: 1=Round 2=Oval 3=Cylindrical 4=Conical 5=Obovate
<input type="checkbox"/>	Rachis (Percent of head): 1=100 2=75 3=50 4=25
<input type="checkbox"/>	Branches: 1=Erect 2=Horizontal 3=Drooping <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> cm Length
<input type="checkbox"/>	Spikelets: 1=Neuter pedicels 2=Staminate 3=Fertile
<input type="checkbox"/>	Glumes: <input type="checkbox"/> <input type="checkbox"/> mm Length
<input type="checkbox"/>	<input type="checkbox"/> 1=Veinated 2=Transverse wrinkle 3=Neither
<input type="checkbox"/>	<input type="checkbox"/> 1=Papery 2=Tough
<input type="checkbox"/>	<input type="checkbox"/> Color: 1=Black 2=Mahogany 3=Red 4=Sienna 5=Straw
<input type="checkbox"/>	<input type="checkbox"/> 1=Smooth 2=Hairy
<input type="checkbox"/>	Awns: 1=Absent 2=Present <input type="checkbox"/> <input type="checkbox"/> mm Length

7. ROOTS:

☐ 1=Fibrous 2=Rhizomatous

8. SEEDS:

<input type="checkbox"/>	Testa: 1=Absent 2=Present
<input type="checkbox"/>	Subcoat: 1=Absent 2=Present
<input type="checkbox"/>	Pericarp: 1=Transparent 2=Opaque
<input type="checkbox"/>	Pericarp Color: 1=White 2=Yellow 3=Red 4=Brown 5=Buff

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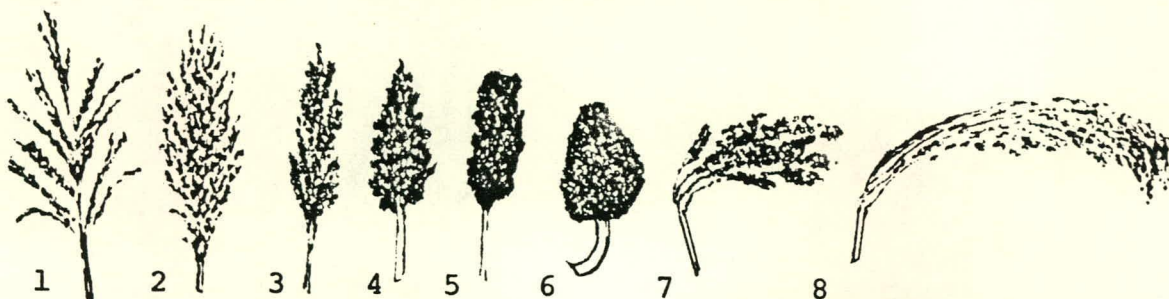
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8. SEEDS (cont.):

- ☒ Endosperm Color: 1=White 2=Yellow
☒ Endosperm Type: 1=Starchy 2=Waxy 3=Sugary 4=Corneous
☒ Endosperm: 1=Plump, rounded 2=Wrinkled 3=Dented
☒ Head Type: (select number from diagram below)



9. DISEASE RESISTANCE (0=Not Tested; 1=Susceptible; 2=Resistant):

- | | | |
|---|--|---|
| <input checked="" type="checkbox"/> Helminthosporium Leaf Blight | <input checked="" type="checkbox"/> Puccinia (Rust) | <input type="checkbox"/> Sooty Stripe |
| <input type="checkbox"/> Periconia Root Rot | <input type="checkbox"/> Bacterial Streak | <input type="checkbox"/> Downy Mildew |
| <input type="checkbox"/> Bacterial Stripe | <input type="checkbox"/> Bacterial Spot | <input type="checkbox"/> Loose Smut |
| <input type="checkbox"/> Charcoal Rot | <input type="checkbox"/> Anthracnose | <input type="checkbox"/> Other (specify) |
| <input checked="" type="checkbox"/> Maize Dwarf Mosaic Virus | <input type="checkbox"/> Head Smut | <input type="checkbox"/> Fusarium Stalk Rot |
| <input type="checkbox"/> Kernel Smut | <input checked="" type="checkbox"/> Other (specify) <u>Head Fusarium</u> | |
| <input checked="" type="checkbox"/> Other (specify) <u>Cercospora</u> | | |

10. INSECT RESISTANCE (0=Not Tested; 1=Susceptible; 2=Resistant):

- ☐ Chinchbug ☒ Greenbug ☐ Other (specify) _____

11. VARIETIES MOST CLOSELY RESEMBLING THAT SUBMITTED FOR THE CHARACTERS GIVEN:

CHARACTER	VARIETY	CHARACTER	VARIETY
Maturity	TX430	Root Type	TX430
Plant Type	TX2743	Seed Type	TX428
Inflorescence Type	TX430	Usage	TX428

REFERENCES:

Doggett, H. 1976. Sorghum. (2nd ed.) Longman's Inc., N.Y.

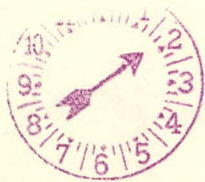
Harlan, J.R. and J. M. J. de Wet. 1972. A simplified Classification of Cultivated Sorghum. Crop Science 12(2): 172-176.

Quinby, J.R., N.W. Kramer, J.C. Stephens, K.A. Lahr and R. E. Karper. 1958. Grain Sorghum Production In Texas. Texas Agric. Expt. Sta. Bull. No. 912.

Wall, J.S. and W. M. Ross, editors. 1970. Sorghum Production and Utilization. AVI Publishing Company, Westport, Conn.

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S O R G H U M

'PH227'

14D. Exhibit D. Additional Description of 'PH227'

'PH227' is a grain sorghum inbred, sorghum bicolor M.

As an inbred per se, 'PH227' is similar to TX430 in a number of plant and seed characteristics. Both inbred lines have dark green leaves, about same midbloom date, purple plant pigment, pithy insipid stalks, leaf length and width, yellow anthers, no subcoat in testa and white pericarp. However, there are some distinguishable differences between 'PH227' and TX430 as stated in Exhibit B. In addition to those differences, 'PH227' has a white endosperm and TX430 has a yellow endosperm; 'PH227' has an opaque seedcoat and TX430 has a transparent seedcoat; 'PH227' yields are below those of TX430.

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14D. Exhibit D. Comparison of 'PH227' and TX430. Values expressed as percent of test mean except yield which is expressed as pounds per acre.

<u>TRAIT MEASURED</u>	<u>'PH227'</u>	<u>TX430</u>	<u>DIFF</u>
Yield	3,600	4,600	1,000
Percent Yield	97	125	28
Moisture	100	105	5
Head Exsertion	71	99	28
Head Type Score	107	79	28
Lodging Score	109	107	2
Plant Height	92	109	17
Root Lodging Score	160	96	64
Days to Flower	105	102	3
Stay Green Score	109	131	23
Grey Leaf Spot Score	169	169	0
Leaf Burn Score	146	146	0
Head Smut Score	64	107	43
Downy Mildew Score	184	109	75
Leaf Rust Score	51	75	24
Weathering Score	122	70	52
Anthraco nose Score	114	76	38
H. turcicum Score	99	107	8
MDMV	87	91	4
Salt Tolerance Score	113	82	31

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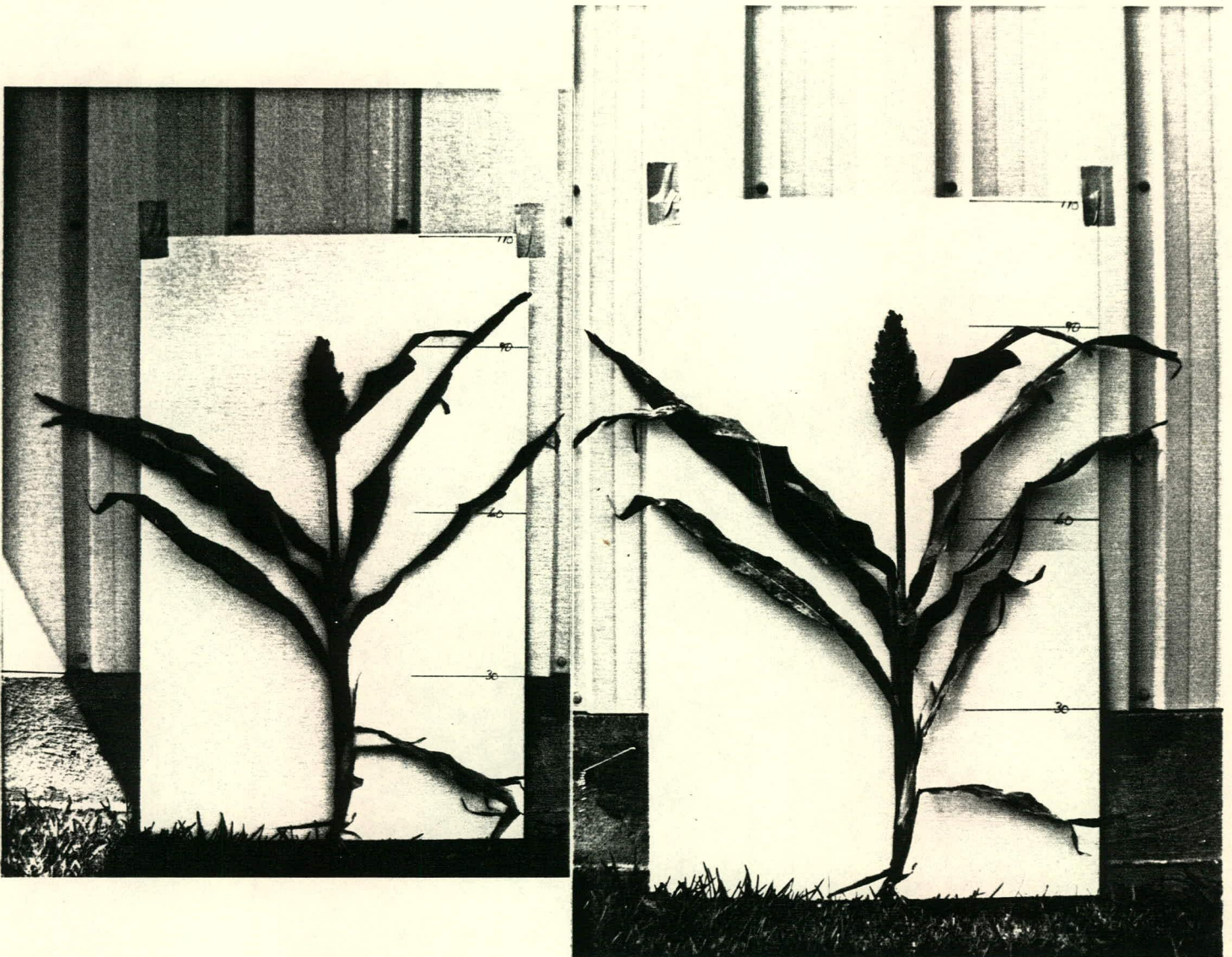


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14D. Exhibit D. Additional Description of 'PH227'

a. Whole plant



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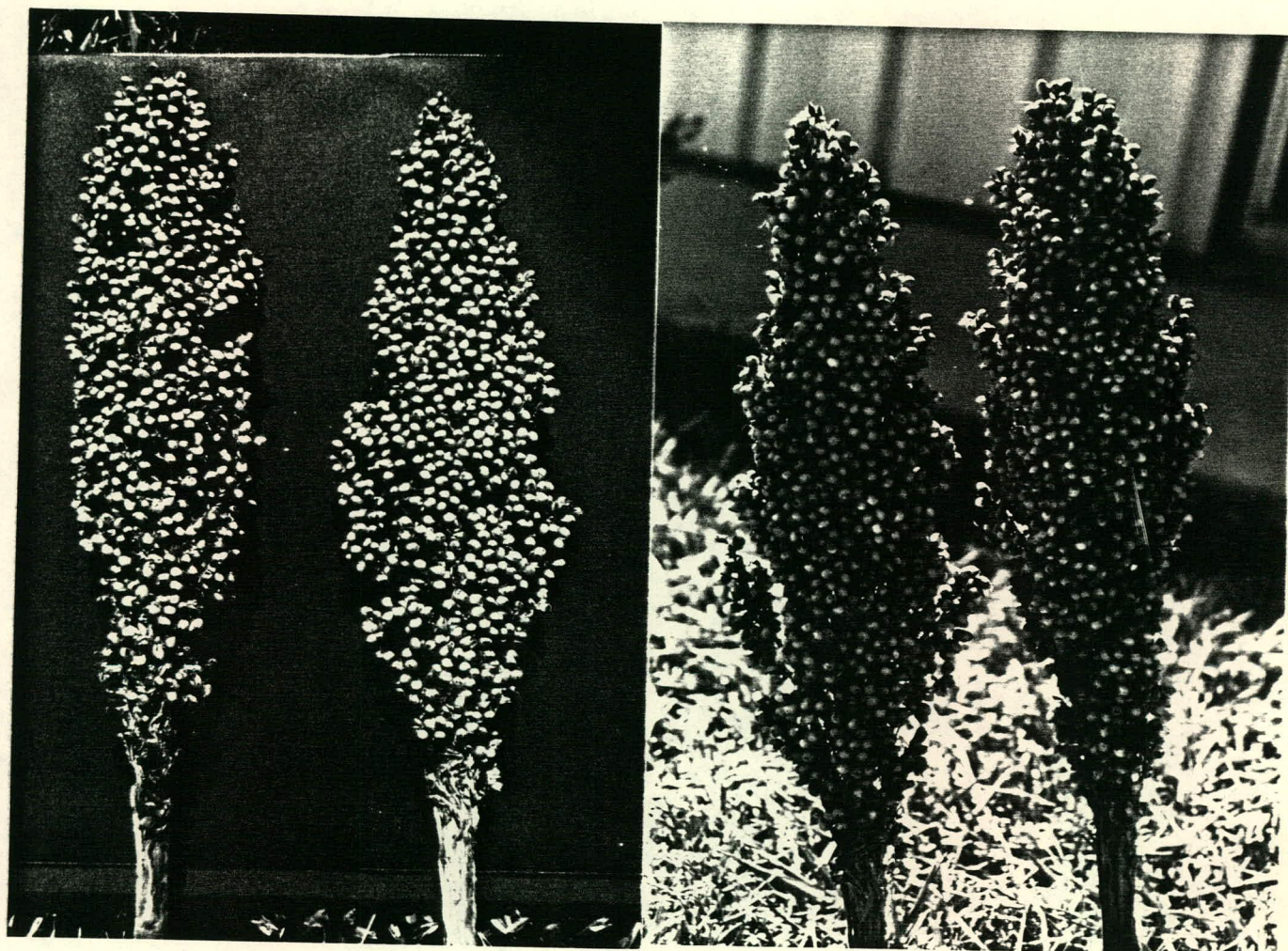
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14D. Exhibit D. Additional Description of 'PH227'

b. Head



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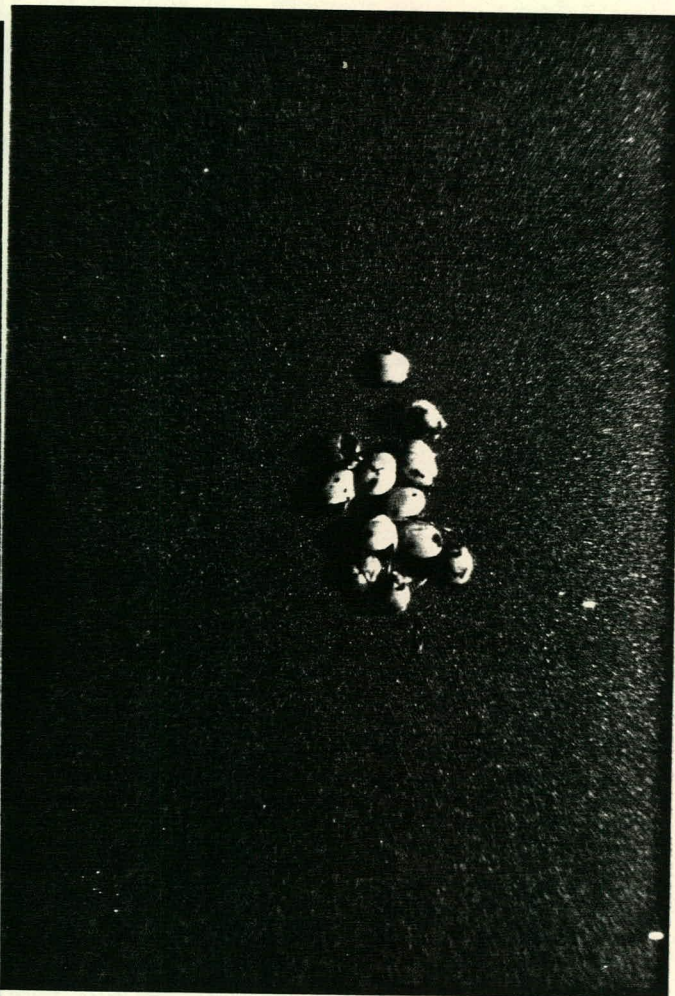
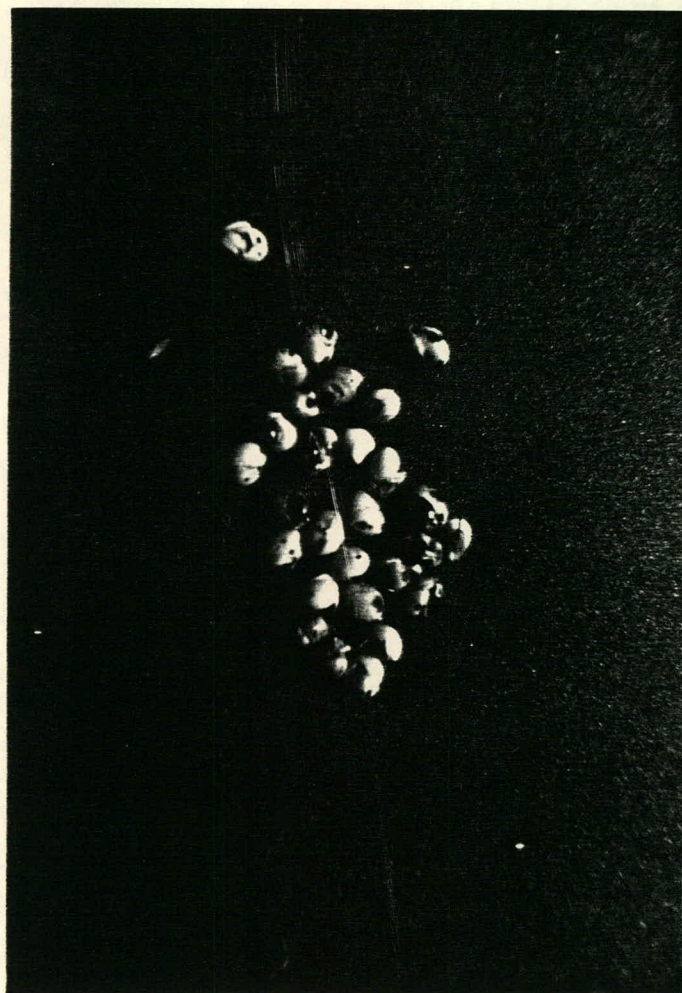
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14D. Exhibit D. Additional Description of 'PH227'

c. Seed



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Exhibit E
(copied from Exhibit A, AB, 7/20/87)

Pioneer Hi-Bred International, Inc., Des Moines, Iowa, is the employer of the plant breeders involved in the selection and development of 'PH227'. Pioneer Hi-Bred International, Inc. has the sole rights and ownership of 'PH227'.



UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

